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(71) Applicant *(for all designated States except US)*: LATCHWAYS LIMITED [GB/GB]; Redman Road, Porte Marsh, Calne, Wiltshire SN11 9PL (GB).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: FLUX, Peter, Robert [GB/GB]; 9 Wenhill Heights, Calne, Wiltshire SN11 0JZ (GB).

(74) Agents: WATKINS, David et al.; Urquhart-Dykes & Lord, 91 Wimpole Street, London W1M 8AH (GB).

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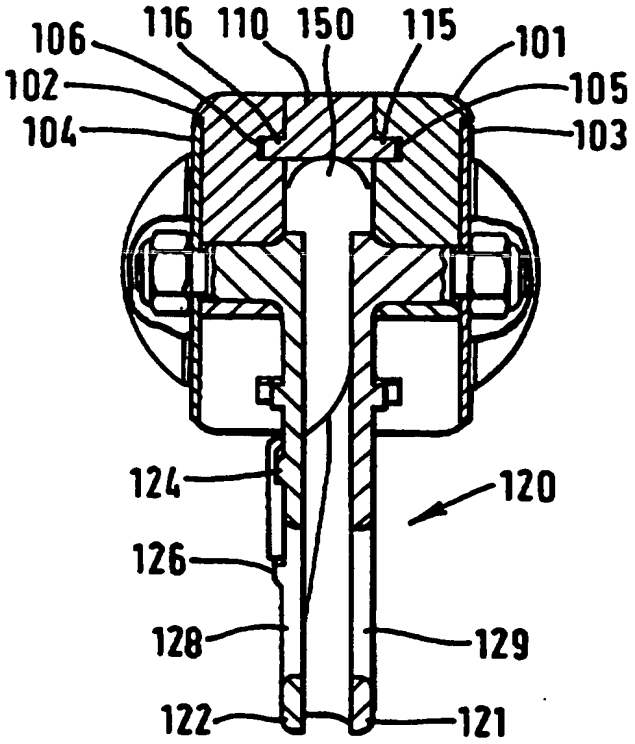
(54) Title: REMOVABLE LOAD TRANSFER DEVICE

(57) Abstract

A load transfer device comprises a pair of spaced-apart rotary members (101, 102), each having at least one recess formed in its periphery and sharing a common axis of rotation. A slipper member (110) is located between the rotary members (101, 102) and defines therewith a space (150) adapted to receive an elongate support element (190) (not shown) along which the device travels in use. Means are provided for attaching a load to the device. The rotary members (101, 102) are rotatably mounted in relation to the slipper member (110) and their recesses are adapted to traverse intermediate brackets (not shown) for said elongate support element without user intervention. The limbs of said intermediate brackets are successively received, guided and passed by the recesses automatically. Access means (123) (not shown) are provided to enable said elongate support element to be introduced into or removed from said space (150) to enable the device to be attached to or removed from the elongate support element.



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REMOVABLE LOAD TRANSFER DEVICE

The present invention relates to a load transfer device which enables a load to be moved along a path defined by an elongate support element, such as a safety line or cable, and past intermediate brackets or attachment points for the elongate support element without fouling. In particular, the invention relates to a load transfer device of the above type which is adapted for easy attachment to and detachment from the elongate support element.

Such a device has numerous applications, for example in building, mining and civil engineering for transferring loads along an overhead guide cable. Similar arrangements may be used in transferring goods and/or personnel from ship to shore and *vice versa* at quayside locations.

Some known load transfer devices suffer from the drawback that they are incapable of negotiating the intermediate brackets along the elongate support element. One solution to this problem is to provide special brackets which can be "opened" to allow the supported load to pass. The weakness of this approach is that the elongate support element temporarily lacks support at the very point where the installer thought it necessary and at the precise moment when it is most needed. Another likely problem is that the brackets may not be accessible to the system user.

An alternative solution is to employ special entry/exit fittings or access points along the elongate support element so that the load transfer device can be attached and removed. The drawback of this proposal is that the access points are not always conveniently situated in relation to the exact location at which attachment or removal is desired.

Improved load transfer devices have been developed which are capable of automatically traversing intermediate brackets for the elongate support element without user intervention. Such devices typically comprise a pair of rotatable wheels having a series of recesses at spaced locations around their peripheries, the adjacent recesses being separated by a radially projecting part of the wheel. A cooperating slipper part is mounted on the wheels by means

of formations which inter-engage with complementary formations on the radially projecting wheel parts. A space between the slipper part and the wheels is dimensioned to receive elongate support element such as a cable or a rigid elongate element.

In use, the device is able to negotiate intermediate brackets for the elongate support element without user intervention by accommodating the bracket legs in a pair of aligned recesses carried by the respective wheels. Rotation of the wheels relative to the slipper part causes the intermediate bracket to pass behind the slipper part, in the aligned recesses of the rotating wheels.

Unfortunately, such devices still fail to address the problem of ease of attachment to or removal from the elongate support element.

A removable load transfer device is known from United States Patent No. 5,245,931. This device has a specially-configured oblique cut-out portion formed in each of its rotating wheels to facilitate removal from and attachment to a safety line or cable. In order to effect such removal or attachment, the wheels must be aligned so that the safety line or cable can be accommodated in the cut-outs at an oblique orientation relative to the axis of rotation of the wheels. This enables the safety line or cable to be passed behind the slipper part. The disadvantage of this device is that it requires precise alignment of a number of parts and is therefore awkward to use. Also, the necessity to orient the device obliquely in relation to the safety line or cable means that considerable clearance is required around the device in order to remove or attach it.

It is therefore an object of the present invention to provide a load transfer device which is capable of negotiating intermediate brackets for the elongate support element without user input and which also allows attachment to and removal from the elongate support element at any point without the need for special entry/exit fittings on the load transfer system.

The invention is a load transfer device comprising:

first and second spaced-apart rotary members sharing a common axis of rotation, each having at least one recess formed in its periphery;

a slipper member extending between the rotary members and defining therewith a space adapted to receive an elongate support element in an orientation substantially perpendicular to said common axis of rotation, along which the device travels in use, and

means for attaching a load to the device;

the arrangement being such that said rotary members are rotatably mounted in relation to the slipper member and said recesses are adapted to traverse support means used to support said elongate element without user intervention by rotation of the rotary members relative to the slipper member such that elements of said support means are successively received, guided and passed by the recesses automatically;

characterised in that access means are provided between the rotary members to enable said elongate element to be introduced into or removed from said space in an orientation substantially perpendicular to the common axis of rotation of the rotary members so as to allow the device to be attached to or detached from the elongate element.

A device constructed in accordance with the invention is especially advantageous because it provides, in a single unit, the capability to traverse automatically the intermediate support brackets provided along a guide system, and ease of attachment to or detachment from the elongate support element at any point throughout its length.

Conveniently, the access means is realised by relative transverse movement between at least one of the rotary members and the slipper member, or between the two rotary members. For example, the parts may be slidable relative to one another. The sliding motion may be along a straight line, or may be on an arcuate path. In an especially preferred arrangement, the body parts on which the rotary members are mounted are arranged to pivot relative to each other in a plane substantially parallel to the plane of rotation of the rotary members. At least one of the body parts has a longitudinal groove on its surface facing the other part. This groove is dimensioned to receive the elongate support element but is exposed only when the body parts are pivoted

out of register. When they are aligned, the groove is obscured and access to it is prevented.

Alternatively, the rotary members may be journalled on individual bosses carried by a separable chassis. When the chassis is separated, the access means is open but, when the chassis is assembled, the access means is closed.

Another alternative is for the rotary members to be positively engaged with the slipper member in a manner which allows them to be prised apart a sufficient distance to permit insertion or withdrawal of the elongate support element. In such an arrangement, the relaxed state of the device is one in which the rotary members share a common axis of rotation and define with the slipper member a space of suitable dimensions to accommodate the elongate support element with sufficient clearance to permit sliding motion. Conveniently, the slipper member is combined with a resilient keep member which exerts a biasing force opposing the action of prising apart. In this way, the device is maintained in a fail-safe condition in which unintentional removal from or attachment to the elongate support element is prevented.

The feature of positive engagement between the rotary members and the slipper member allows other forms of the invention to be designed in which insertion or removal of the elongate support element involves passage of the elongate support element across the common axis of rotation of the rotary members. By virtue of the fact that the rotary members are positively engaged with the slipper member, the axle means for rotatably mounting the rotary members may be reduced in size to minimal stub axles between which a support element-receiving passageway is defined. This passageway is equipped with gate means to prevent accidental insertion and/or removal of the elongate support element.

Conveniently, the gate means form part of the load attachment means. Most preferably, the arrangement is such that engagement of a load with the load attachment means is itself effective to lock the device against accidental removal from the elongate support element.

Most advantageously, the device incorporates releasable means for maintaining the rotary members and the slipper member in a closed condition in which introduction or removal of the elongate support element is prevented. This feature means that a conscious decision must be taken on the part of the user to open the device.

Preferably, the releasable means includes a positive locking mechanism which retains the parts in the closed condition against accidental release. The locking mechanism may be biased to its non-release position for added safety. As indicated above, the presence of a load engaged with the load attachment means may serve to prevent accidental release.

In another variation of the invention, a releasable spindle is used to rotatably mount one of the rotary members. In its non-release condition, the releasable spindle is positively engaged with another part, for example with a chassis member or perhaps with a portion of the spindle on which the other rotary member is mounted. The releasable spindle may not be pulled away from its positive engagement without first operating a release catch, and hence disengaging the locking mechanism, by an intentional action. In the closed and locked condition, it is not possible for the device to be removed from or attached to the elongate support element.

The rotary members may be provided with a formation on the respective surfaces thereof facing the slipper member, for cooperation with a complementary formation on the slipper member. This helps to maintain the relatively rotatable parts in their respective operating relationships. For example, the rotary members may each be provided with a surface groove which cooperates with complementary projections on the slipper member. Alternatively, the grooves may be provided on the slipper member and the projections on the rotary members.

In one form of the invention, one of the grooves may be formed with an undercut profile so that it surrounds the head portion of its cooperating projection or projections and thereby effects a positive engagement between the cooperating parts. Such an arrangement would allow one of the rotary

members to be positively engaged with the slipper member so that the two are movable as a unitary element in relation to the other rotary member.

Alternatively, both grooves are formed with an undercut profile, enabling each of the rotary members to be positively engaged with the slipper member. This type of arrangement is particularly suited to the embodiment discussed above in which the components are prised apart against biasing pressure to create a gap for the elongate support element.

The rotary members may be in the form of wheels having a plurality of petals projecting radially from their hubs. The petals then define, between adjacent pairs thereof, recesses of the type required for automatic traversing of the elongate support element intermediate brackets. The provision of a plurality of recesses may be helpful in aligning the device with respective limbs of successive elongate support element brackets during a lengthy traverse.

One or more rollers may be incorporated in the slipper member to ease passage of the device along the elongate support element in normal use.

The important feature of all manifestations of the device is the ability to create a gap which allows the elongate support element to be introduced into or removed from the space defined between the rotary members and the slipper member.

The invention will now be described by way of example only with reference to the drawings, in which:

Figure 1 is a side view of an especially preferred form of the invention, with one of the rotary members and its cover omitted for clarity, showing attachment of the device to a cable;

Figure 2 is a front sectional view of the device shown in Figure 1;

Figure 3 is an end view of one embodiment of a device constructed in accordance with the invention, in the closed condition;

Figure 4 is a view showing the device of Figure 3 in the open condition;

Figure 5 is a view corresponding to Figure 3, showing the device with slipper member, rotary members and covers omitted for clarity;

Figure 6 is a view corresponding to Figure 4, with the slipper member, rotary member and covers omitted for clarity;

Figure 7 is a view of the device of Figures 3 - 6, showing how attachment of a load prevents accidental removal from elongate support element;

Figure 8 is an end view of another embodiment of a device constructed in accordance with the invention;

Figure 9 is a side view of the device shown in Figure 8;

Figure 10 is an end sectional view showing the device of Figures 8 and 9 in the open condition, and

Figure 11 is an end sectional view of the device of Figures 8 to 10, showing how it is locked in the closed condition by attachment of a karabiner hook.

Figure 12 shows, in stages, the passage of a device constructed in accordance with the present invention as it negotiates a typical elongate support element intermediate bracket.

Referring now to Figures 1 and 2, an especially preferred embodiment of a removable load transfer device constructed in accordance with the invention is shown. The device comprises a pair of rotary members (only one shown in Figure 1) in the form of so-called starwheels 101, 102 each having a respective cover member 103, 104. The cover members serve to protect the petals of the starwheels from damage in use of the device and may be fashioned to assist in aligning the device with intermediate support brackets as the device is traversed along an elongate support element such as a wire or cable.

A slipper member 110 is located between the starwheels 101, 102. Slipper member 110 is provided with a pair of side projections 115, 116 which are engaged in complementary grooves 105, 106 formed in the respective

starwheels 101, 102. In the closed condition as shown in Figure 2, the combination of starwheels 101, 102 and slipper member 110 define a space 150 in which an elongate support element (not shown) is receivable in use.

A chassis 120 is comprised of two relatively pivotable members 121, 122. Member 121 is formed on its surface facing member 122 with a longitudinal groove 123 which is dimensioned to accommodate an elongate support element 190. Member 121 is further provided with stops 125, 127 for limiting the extent of pivotal movement relative to member 122. Member 122 is provided on its outer surface with arcuate guides 124, 126 which interact with stops 125, 127 to enhance smooth operation of the device.

Insertion of the elongate support element 190 into the groove 123 is only possible when the respective members 121, 122 are pivoted out of alignment to expose the groove fully. When the groove is partly or wholly obscured, the gap between members 121, 122 is too small to allow the elongate support element 190 to be inserted or removed. However, in this condition, the members 121, 122 are still capable of relative pivotal movement provided that the elongate support element 190 is located in the groove 123.

In Figure 1(a) the first step is shown for attachment of the device to an elongate support element 190. Members 121, 122 are pivoted out of alignment to expose groove 123 and then the device is offered to elongate support element 190 such that it is accommodated in the groove 123.

Then the members 121, 122 are pivoted towards a neutral position in which they overlie each other. This condition is shown in Figure 1(b).

Continuation of this pivotal movement to the condition shown in Figure 1(c) exposes the groove 123 at the other side of member 122. In this condition, the elongate support element 190 may be removed from the groove. Re-alignment of the members 121, 122 prevents access to the groove and the elongate support element 190 is held captive in the space 150 defined by starwheels 101, 102 and slipper member 110.

Removal of the device from the elongate support element 190 is effected by execution of the above steps in the reverse order.

It will be noted that each of the members 121, 122 is formed with a respective connecting eye 129, 128. These are adapted to receive a connector such as a karabiner hook on which a load is supported in use of the device. The arrangement is such that the connecting eyes are aligned when the device is in its neutral condition, so that engagement by a karabiner hook or similar connector prevents relative pivotal movement of the members 121, 122. Thus, it is not possible to attach the device to, or remove it from, an elongate support element 190 when a load is attached through the connecting eyes 129, 128. Therefore, the device is inherently fail-safe.

Referring now to Figure 3, a first embodiment of a load attachment device constructed in accordance with the present invention is shown. The device comprises a pair of rotary members in the form of so-called starwheels 201, 202 each having a respective cover member 203, 204. The cover members serve to protect the petals of the starwheels from damage in use of the device and may be fashioned to assist in aligning the device with elongate support element intermediate brackets as the device is traversed across such features.

A slipper member 210 is located between the starwheels 201, 202. Slipper member 210 is provided with a pair of side projections 215, 216 which are engaged in complementary grooves 205, 206 formed in the respective starwheels 201, 202. Side projection 215 is formed with an undercut profile and groove 205 is formed with a re-entrant profile, enabling the slipper member 210 and the starwheel 201 to be positively engaged to each other whilst allowing relative rotation therebetween. By contrast, side projection 216 and groove 206 have plain profiles which permit disengagement of the slipper member 210 and the starwheel 202 from each other. In the closed condition as shown, the combination of starwheels 201, 202 and slipper member 210 define a space 250 in which an elongate support element (not shown) is receivable in use.

A chassis 220 is comprised of two separable portions 221, 222. This is best seen with reference to Figure 5, in which the slipper member 210, starwheels 201, 202 and their respective covers 203, 204 have been omitted

for clarity. A control catch 230 overlies the separable portions 221, 222 and keeps them together when the apparatus is in the closed condition. A lock pin 226 formed on the separable chassis portion 221 is received in L-shaped slot 236 formed in the control catch 230. Disengagement of the separable chassis portions 221, 222 is constrained by the interaction of the lock pin 226 with the L-shaped slot 236, so that the motion of disengagement follows a pre-determined path.

Each of the separable chassis members 221, 222 and control catch 230 has a depending leg portion in which an attachment eye is formed. When the device is in the closed condition, as depicted in Figures 3, 5 and 7, the respective attachment eyes are arranged to align to form an aperture 240 adapted to receive an attachment for a load.

As seen with reference to Figure 5, the separable chassis portions 221, 222 each have a spigot 223, 124 on which the respective starwheels 201, 202 are rotatably mounted.

Referring now to Figure 4, the load attachment device of Figure 3 is shown in the open condition. In this view, it can be seen that the lock pin 226 is located at the other end of the L-shaped slot 236 in the control catch 230. Separable chassis portion 222 has been pivoted out of engagement with separable chassis portion 221, carrying with it starwheel 202 and its respective cover 204. By virtue of the plane profiles of the groove 206 in starwheel 202 and of side projection 216 of slipper member 210, this pivotal movement causes separation of the starwheel 202 from the slipper member 210 and creates a gap 260 through which an elongate support element in the form of a length of cable 290 is able to pass. It will be noted that, in this open condition of the device, the aperture 240 is obscured by misalignment between the attachment eyes of the control catch 230 and those of the separable chassis portions 221, 222. It is therefore impossible for the device to be attached to or removed from cable 290 when a load is connected through aperture 240.

Figure 6 shows the separation of the separable chassis portions 221, 222 more clearly by omitting the detail of the slipper member 210, starwheels

201, 202 and their respective cover members 203, 204. Optionally, the separable chassis portion 224 has an alignment spigot 228 on the opposite side from the spigot 224 on which starwheel 202 is journalled. The alignment spigot 228 is receivable in a recess (not shown) in separable chassis portion 221 when the device is closed and helps to prevent cable 290 from entering between the separable chassis portions 221, 222 when the device is open.

Referring now to Figure 7, this is a similar view to Figure 3, but shows the device with a karabiner hook 280 connected through the aperture 240. In this condition, it is impossible to manipulate the control catch 230 in such a way that the device can be opened and cable 290 released. It is therefore essential for any load to be detached from the device before the device itself can be removed from the cable 290.

Referring now to Figure 8, a second embodiment of a removable load attachment device is shown. This device comprises a pair of starwheels 301, 302 with a slipper member 310 interposed between them. In the closed condition, as best seen in this Figure, the combination of starwheels 301, 302 and slipper member 310 define a space 350 in which an elongate support element (not shown) is receivable in use.

A resilient keep member 319 is fastened over the slipper member 310 and starwheels 301, 302 which serves to urge the slipper member/starwheel assembly to the closed condition.

Figure 9 shows a side view of the device, from which it is easy to see why starwheels are so-named. In this view, only one starwheel 301 is visible and it is to be assumed that this is directly superimposed over its companion starwheel 302. However, it is to be noted that, in practice, the respective starwheels of a load attachment device constructed in accordance with the present invention are independently rotatable. The hub portion of starwheel 301 is provided with an aperture the function of which will be described in more detail below. The periphery of starwheel 301 has a plurality of petals 307 each separated by a recess 309. The function of such petals and recesses will also be described subsequently.

As best seen with reference to Figure 10, which shows the device in the open condition, slipper member 310 is formed with a pair of side projections 315, 316 which are engaged in complementary grooves 305, 306 formed in the respective starwheels 301, 302. Each of the side projections and grooves has a plain profile to permit a degree of lateral separation between the engaging parts. Such lateral separation is important in allowing the device to be prised open against the biasing force of the keep member 319. Once opened, a gap 360 is created through which elongate support element in the form of a cable 390 is able to pass. After the cable 390 has been inserted into or removed from the space 350, the device is allowed to relax to the closed condition under the biasing force of the keep member 319.

Referring now to Figure 11, the device is shown locked onto cable 390 by the presence of a karabiner hook 380 threaded through the apertures at the hubs of the respective starwheels 301, 302. In this condition, it is impossible to manipulate the starwheels in such a way that the device can be opened to release the cable 390 because the exit passageway is blocked by the karabiner hook 380. It is therefore essential for any load to be detached from the device before the device itself can be removed from the cable 390.

In yet another embodiment (not illustrated) having a similar working principle to the embodiment depicted in Figures 8 to 10, the starwheels may be mounted on separable chassis elements which have depending attachment eyes. In this construction, the karabiner hook is not threaded through apertures provided at the starwheel hubs, but is threaded through the attachment eyes instead. The same barrier to separation of the starwheels is therefore present whenever a load is attached.

The function of the starwheel petals and their associated recesses will now be described with reference to Figure 12, which shows the sequence of operations undertaken by the device whenever it traverses an intermediate bracket for the elongate support element.

View 12(a) shows stage 1 in which the device 400 passes along elongate support element 490 in the form of a cable and partially entraps the guide tube 494 of a cable support bracket 491. In this view, the slipper

member 410 passes behind the bracket legs 493 and does not foul on them. These legs 493 maybe any shape in cross-section and not necessarily square as shown in the Figure. Starwheel 401, which lies in a similar plane to the curved bracket legs 493, offers a gap or recess between two adjacent petals 407. Should the situation arise where a recess is not in register with the bracket legs 493, contact between a petal tip and the legs 493 causes the starwheel 401 to rotate slightly and thereby bring a recess into alignment with the leg. Similar principles apply in relation to the second starwheel which is omitted from this Figure for clarity.

In the presently-described sequence, since the motion of the device 400 is in the sense of down the page, the bracket leg 493 abuts against the approaching petal and rotates it clockwise. In so doing, the device 400 moves to the position shown in view 12(b). The condition represented by view 12(c) is similar to that shown in view 12(a) in that the device is shown traversing the second leg 493 of the cable intermediate bracket 491. Ultimately, the device passes beyond the bracket 491 as shown in view 12(d). It is to be noted that the direction of the turning force is always correct for either direction of travel of the device.

The turning force on the starwheels is opposed by frictional forces occurring between the starwheels and their respective axles and also by frictional forces arising from relative movement between the starwheels and the slipper member 410. Such frictional forces may be reduced by the application of low friction coatings or other bearing technology.

Although the invention has been particularly described with reference to embodiments employing so-called starwheels, it will be understood by persons skilled in the art that this is non-limitative and that other forms of rotary member can be used. Various other modifications may also be apparent to skilled persons without departing from the scope of the claims which follow.

CLAIMS

1. A load transfer device comprising:

first and second spaced-apart rotary members sharing a common axis of rotation, each having at least one recess formed in its periphery;

a slipper member extending between the rotary members and defining therewith a space adapted to receive an elongate support element in an orientation substantially perpendicular to said common axis of rotation, along which the device travels in use, and

means for attaching a load to the device;

the arrangement being such that said rotary members are rotatably mounted in relation to the slipper member and said recesses are adapted to traverse support means used to support said elongate element without user intervention by rotation of the rotary members relative to the slipper member such that elements of said support means are successively received, guided and passed by the recesses automatically;

characterised in that access means are provided between the rotary members to enable said elongate element to be introduced into or removed from said space in an orientation substantially perpendicular to the common axis of rotation of the rotary members so as to allow the device to be attached to or detached from the elongate element.

2. A load transfer device as claimed in claim 1 wherein the access means is realised by relative transverse movement between at least one of the rotary members and the slipper member.

3. A load transfer device as claimed in claim 2 wherein the parts are slidable relative to one another along an arcuate path.

4. A load transfer device as claimed in claim 1 wherein the rotary members are journalled on individual bosses carried by a separable chassis, the arrangement being such that, when the separable parts of the chassis are disengaged, the access means is open and, when the separable parts of the chassis are engaged, the access means is closed.

5. A load transfer device as claimed in claim 1 wherein the rotary members are positively engaged with the slipper member in a manner which allows said rotary members to be prised apart a sufficient distance to permit insertion or withdrawal of the elongate support element.

6. A load transfer device as claimed in claim 5 wherein the slipper member is combined with a resilient keep member which exerts a biasing force opposing the action of prising apart.

7. A load transfer device as claimed in claim 1 wherein the rotary members are positively engaged with the slipper member in a manner which defines an elongate support element-receiving passageway between said rotary members.

8. A load transfer device as claimed in claim 7 wherein gate means is provided to prevent accidental insertion and/or removal of the elongate support element.

9. A load transfer device as claimed in claim 8 wherein the gate means forms part of the load attachment means.

10. A load transfer device as claimed in claim 1 wherein a releasable spindle is used to rotatably mount one of the rotary members.

11. A load transfer device as claimed in any preceding claim wherein the rotary members are in the form of wheels having a plurality of petals projecting radially from their hubs, said petals defining, between adjacent pairs thereof, recesses adapted to traverse intermediate brackets for the elongate support element without user intervention.

12. A load transfer device as claimed in any preceding claim wherein one or more rollers is incorporated in the slipper member.

13. A load transfer device as claimed in any preceding claim wherein engagement of a load with the load attachment means is effective to lock the device against accidental removal from the elongate support element.

FIG. 1(c)

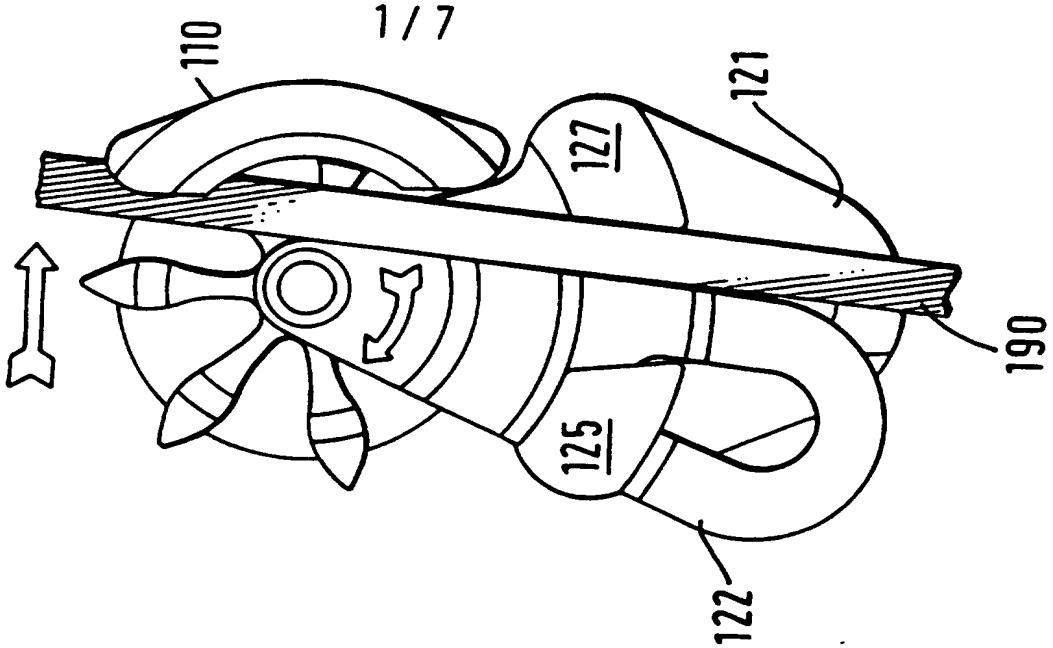


FIG. 1(b)

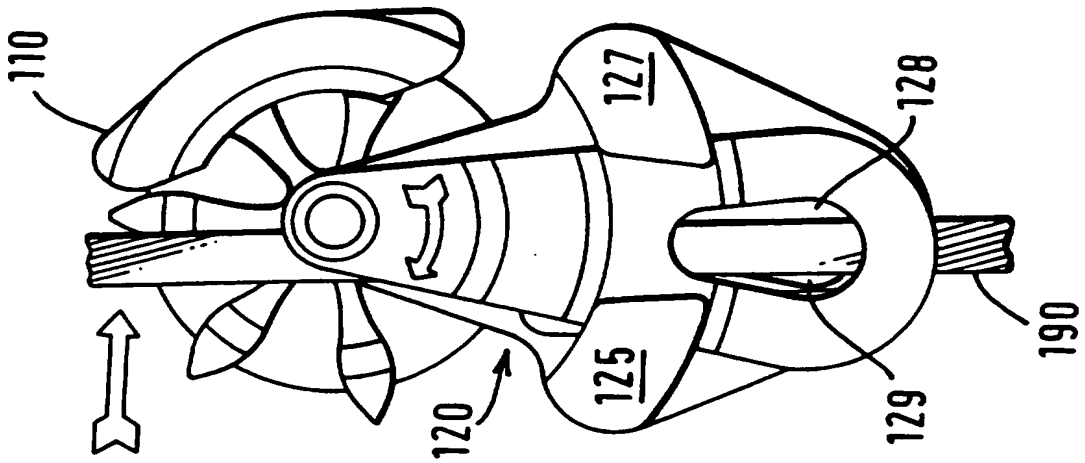


FIG. 1(a)

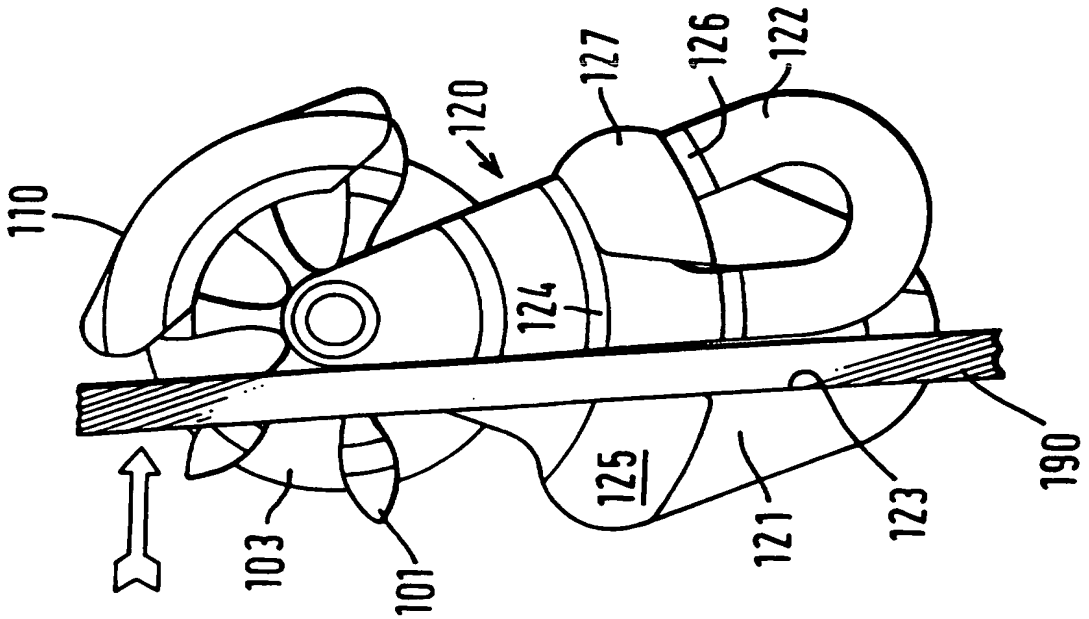
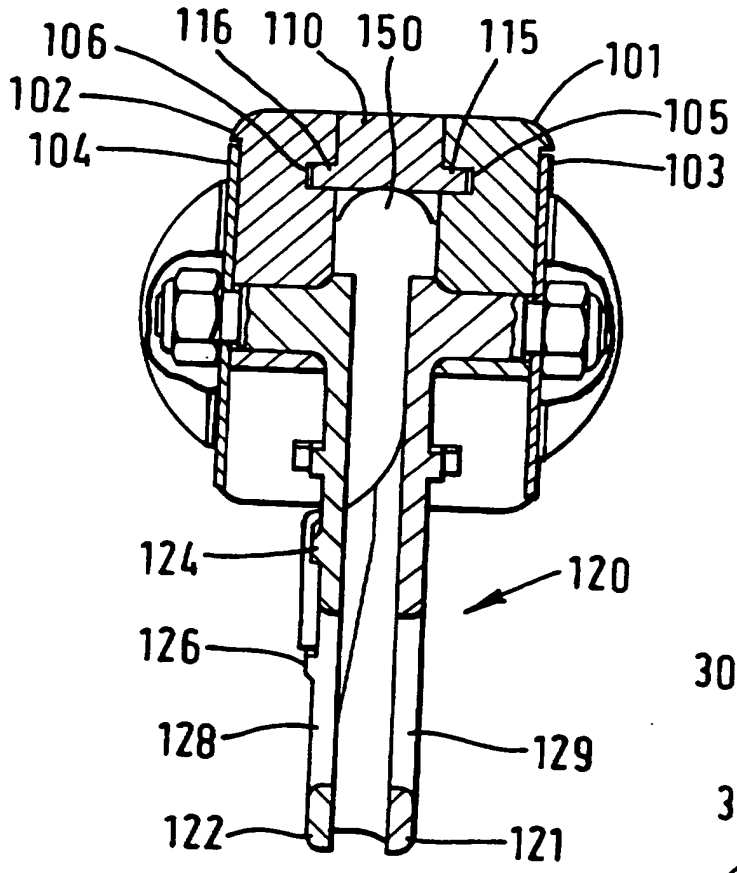


FIG. 2



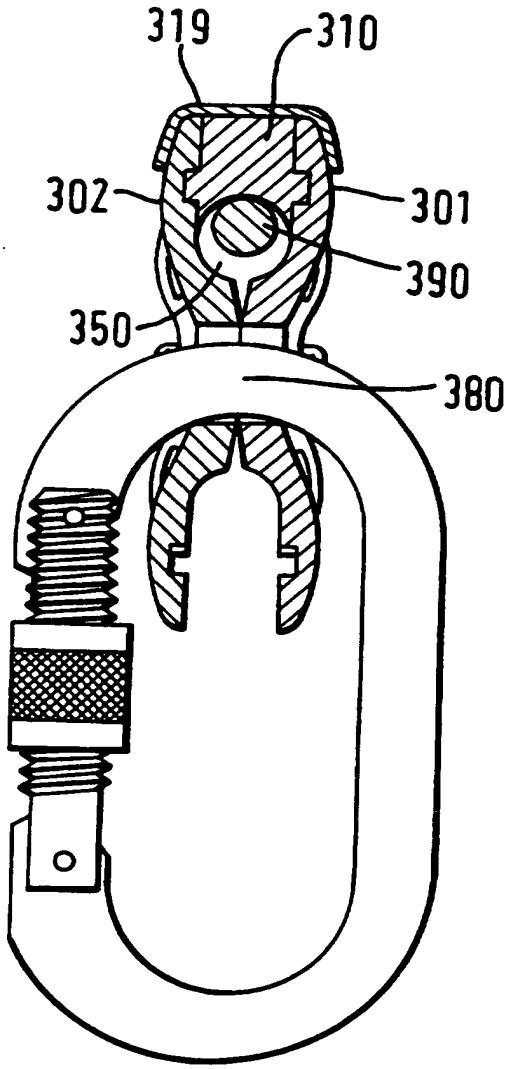


FIG. 11

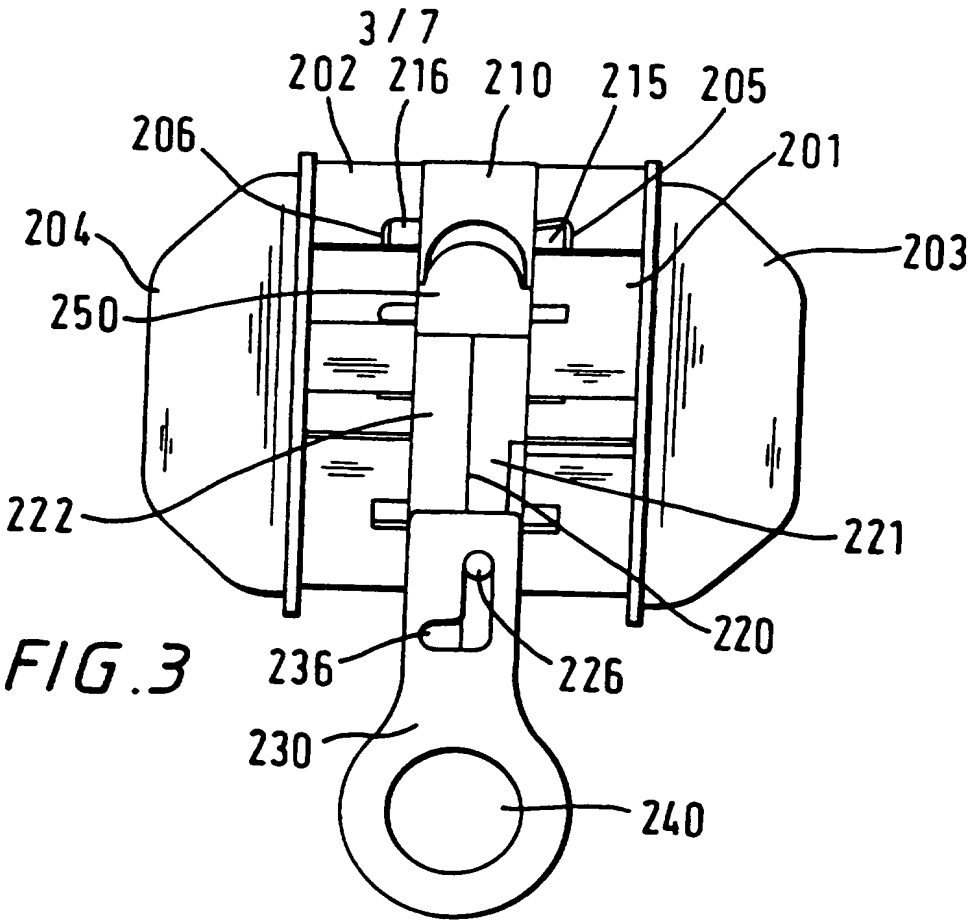


FIG. 3

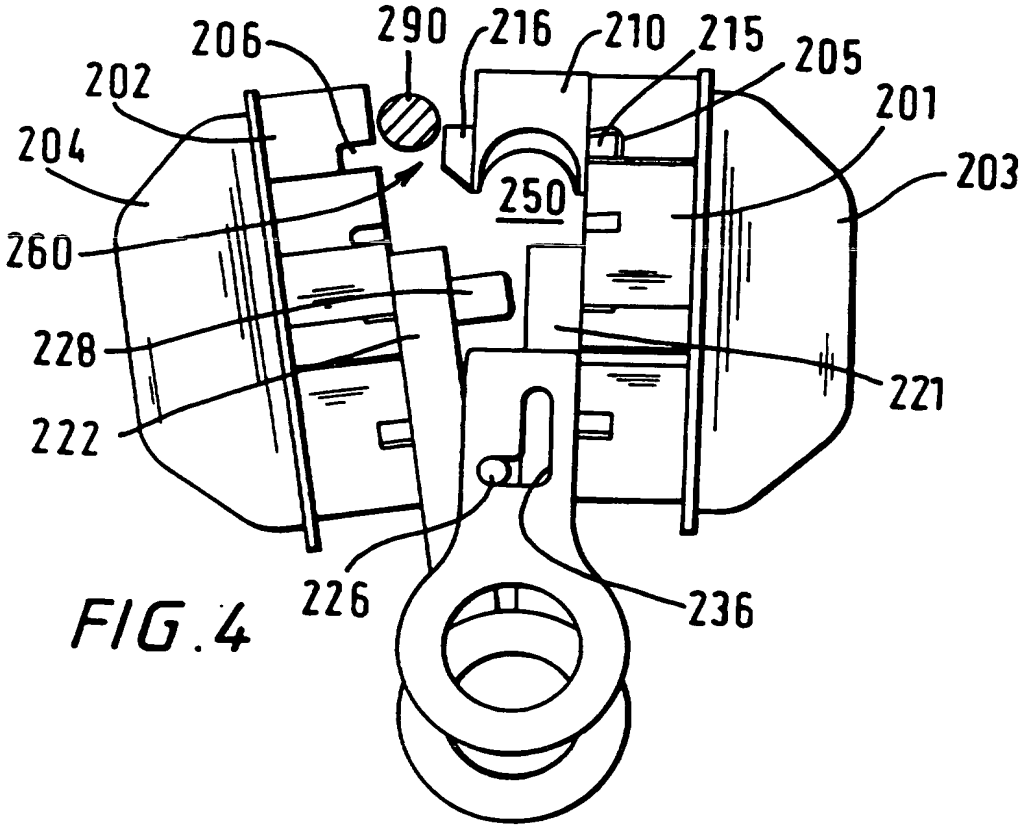


FIG. 4

FIG. 5

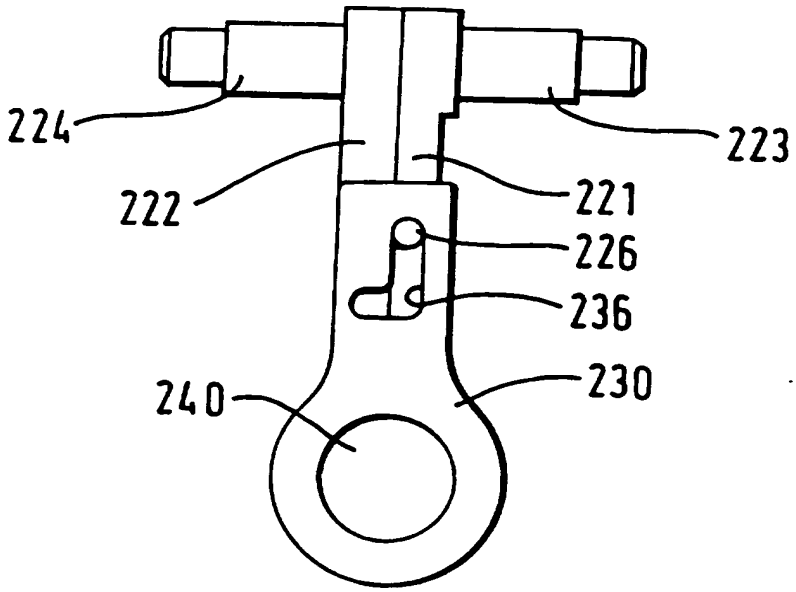


FIG. 6

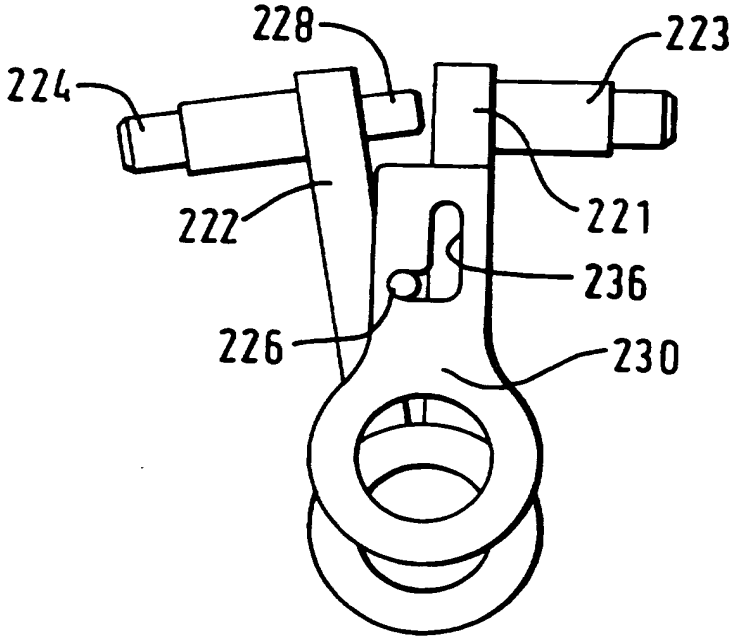


FIG. 7

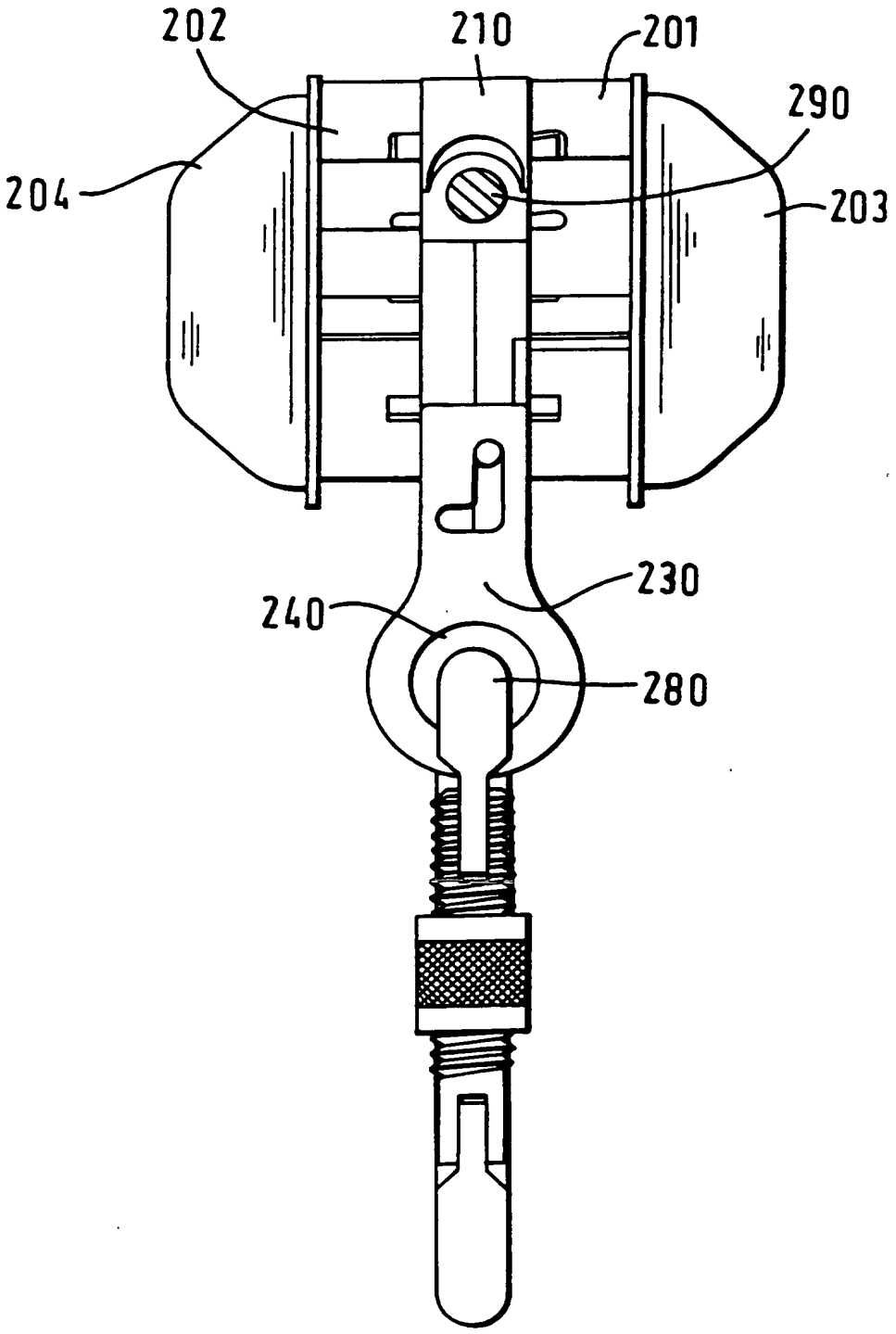


FIG. 8

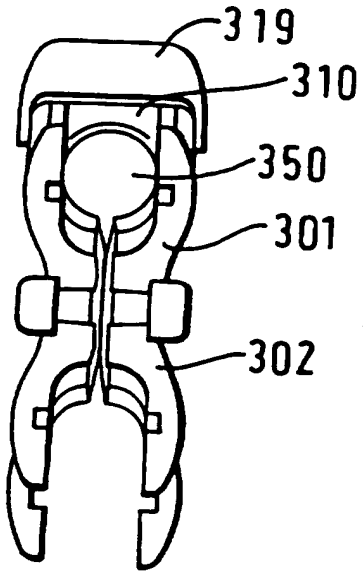


FIG. 9

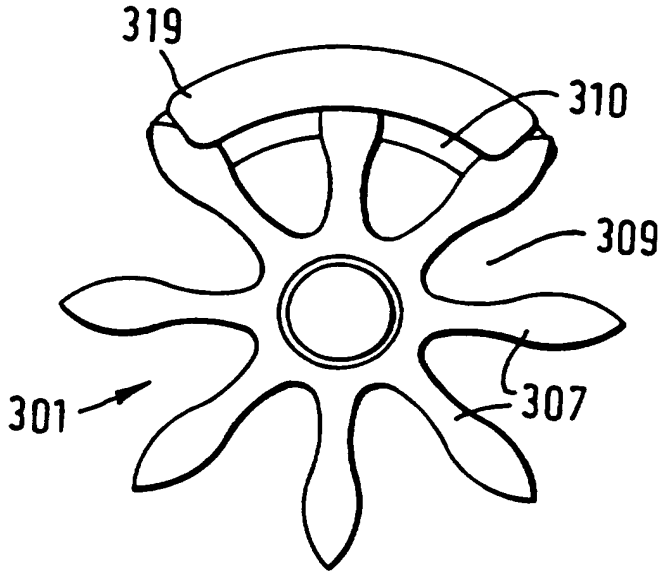


FIG. 10

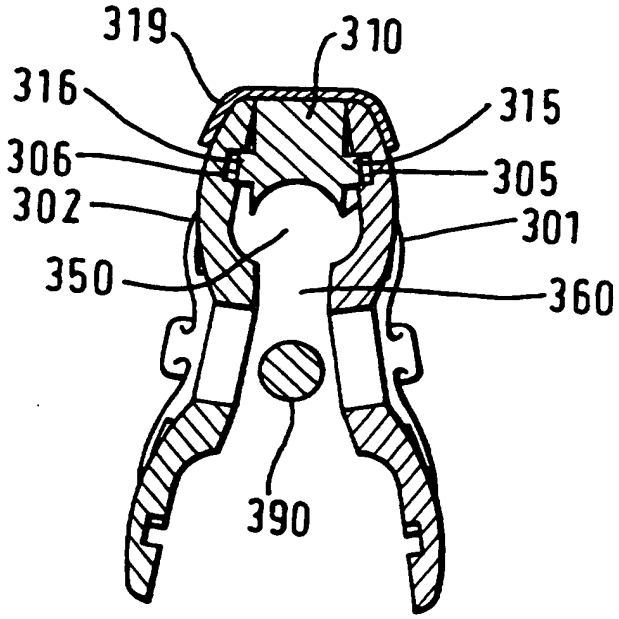
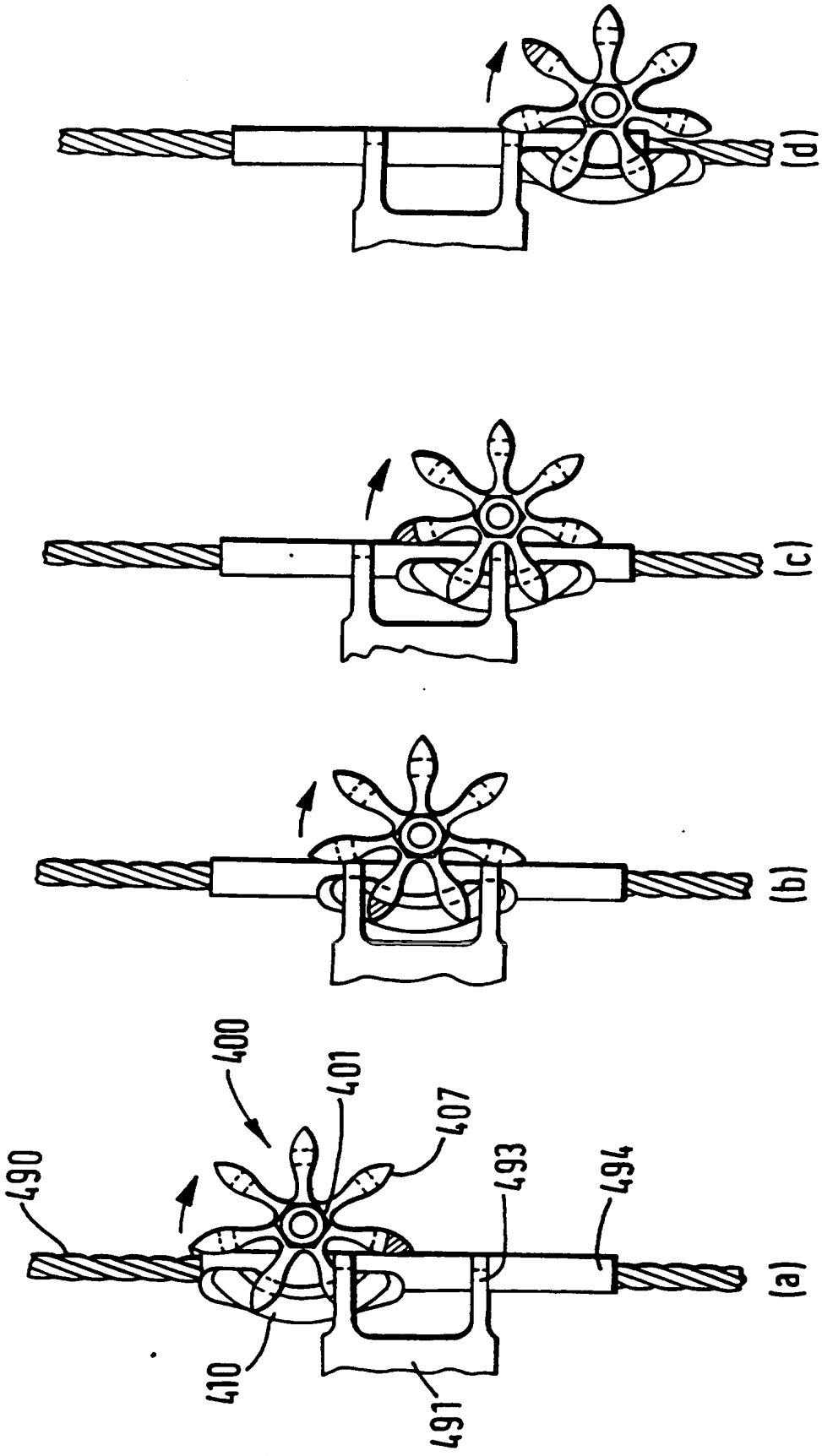


FIG. 12



INTERNATIONAL SEARCH REPORT

Int. .onal Application No
PCT/GB 95/01674

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B66D3/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B66D A62B B61B B63C B63H B66C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 401 087 (GÉN. D'ART. DE MATÉRIELS ET D'EQUIPEMENTS DE SPORTS ET DE SÉCURITÉ) 5 December 1990 see abstract; figures ---	1
A	US,A,5 056 760 (JORGENSEN) 15 October 1991 see abstract; figures ---	1,3
A	EP,A,0 058 810 (CHARLET S.A.) 1 September 1982 see abstract; figures -----	1

[ ] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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1

Date of the actual completion of the international search	Date of mailing of the international search report
19 September 1995	- 6. 10. 95

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Guthmuller, J

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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No
PCT/GB 95/01674

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		US-A-	5245931	21-09-93
US-A-5056760	15-10-91	NONE		
EP-A-0058810	01-09-82	FR-A-	2500424	27-08-82
		FR-A-	2516064	13-05-83